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FACTORS IN THE COST OF PRODUCING BEEF IN THE FLINT HILLS SECTION OF KANSAS

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THE GRASS-CATTLE INDUSTRY IN KANSAS

In the central and southern portion of the eastern half of Kansas is a section of rough topography, commonly called the Flint Hills. (Fig. 1.) Within this section are more than 3,000,000 acres of land in the native prairie grasses used for the grazing of cattle. Much of this land is too rough for cultivation and is in permanent pasture. On these pastures approximately 500,000 head of cattle are grazed each year.

The size of the section and its importance in the agriculture of Kansas and in the beef industry make problems in the production of beef here of interest to a territory far wider than the 15 or 20 counties included within the section.

It was with a view to learning the number of acres of grass required to put the normal gains on steers that graze in this territory, the methods used in handling steers and the factors which constitute the costs attached to these cattle while they were in the Flint Hills section, together with a determination of the economic position of summer grazing of cattle in Kansas in its relation to the beef-cattle industry and to the markets for livestock, that a study was begun in 1921 by the United States Department of Agriculture in cooperation with the Kansas Agricultural Experiment Station.

It is believed that information gained in this study will be of value to cattlemen of the territory when making their plans for the quantities of the various feeds necessary for the production of beef, when determining the carrying capacity of pastures, and in the use of other pertinent facts pertaining to beef production. The information obtained in this study is also an aid to cattlemen in deciding upon the methods best suited to their conditions and in estimating the probable results to be secured.

CHARACTERISTICS OF THE FLINT HILLS SECTION

The topography of the Flint Hills section varies from gently rolling to rough and broken. Much of the soil on the hills is rocky, containing fragments of the flint and limestone rocks from which the soil is derived. The farm land is located along the creek and river valleys. The soil containing the flint rock is usually deeper and heavier than that containing limestone rock, makes better growth of pasturage, and does not dry up so quickly in dry weather.

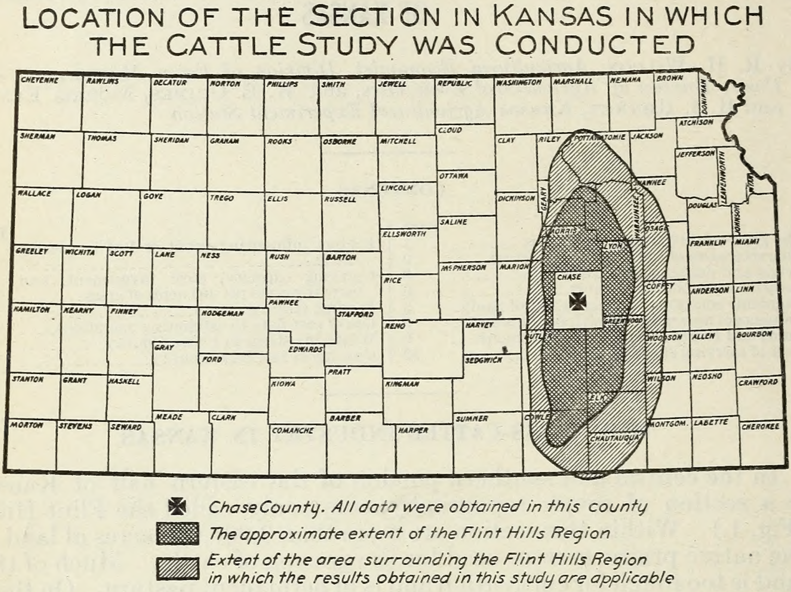

FIG. 1.—The Flint Hills lie in the eastern part of Kansas

The principal grasses in these pastures are bluestem and the native grama grasses with some Kentucky bluegrass in the lower and more moist places, and some buffalo grass on the high, level stretches. The general farming operations conducted in the creek and river valleys within the pasture district consist chiefly of the production of feed crops which, although used principally for horses and milk cows, can be used for the wintering of beef-cow herds and those steers which are carried through winter. Alfalfa, corn, wheat, the sorghums, oats, and prairie hay are the principal crops.

The amount and distribution of the average yearly rainfall and of the rainfall in 1921, 1922, and 1923 at Bazaar which is centrally located in Chase County, are given in Table 1. The spring and summer rainfall is of particular importance, although the moisture stored in the soil during the winter months aids in starting the grass in the spring and helps to keep it growing during the grazing season.

ORIGIN AND DESTINATION OF CATTLE

In the later sixties the movement of steers from Texas through this section began. At first they were kept moving toward Kansas shipping points; a few years later Texas cattle were started earlier in the spring and allowed to graze through the summer in the Kansas Flint Hills. Free range rapidly disappeared and fenced holdings covered the territory. Since the disappearance of the free range, the industry has remained on much the same basis, with cattle shipped in from Texas and other southern and western areas. A few herds are wintered in the section and then finished on grass during the following season.

The cattle involved in this study came principally from the Southwest, a few being from Kansas. Texas ranges furnished four-fifths of the steers. The Panhandle section furnished more than all the rest of Texas, sending 13,538 of the cattle under study. Central Texas furnished 3,204 head, southern Texas 3,295 head, and the Texas coast 2,520 head, and 379 head came from northeastern Texas. Northern Oklahoma ranked next with 1,408 head, followed by western Kansas with 1,261 head, New Mexico with 612 head, eastern Kansas with 102 head, and Mexico with 120 head.

The movement of cattle from Texas and other range areas into Kansas usually begins in March and April and is practically completed by the middle of May. The movement of cattle from Kansas pastures to market begins in July. The heaviest shipments of cattle during the three years of this study occurred during the latter half of August and the latter half of September. All of the cattle on leased pastures were on the way to market by the last of October. Most of the steers shipped out of the Flint Hills go to the Kansas City market.

LOCATION AND METHOD OF STUDY

The pastures upon which cost studies were made are located in and about Chase County, in the center of the Flint Hills section. (Fig. 2.) A field man stationed in the territory spent his entire time gathering figures upon cattle as they arrived, and these cattle were under his personal observation through the summer grazing season. He also gathered information upon any cattle that were held over and fed through the winter. Records of the weights of cattle when put on and taken off grass were obtained. In addition the acreage of pasture grazed was carefully measured, the quantities of feeds weighed, and information was obtained regarding the quantities and costs of man labor and horse work, equipment, and other materials used.

ECONOMIC CONDITIONS DURING PERIOD OF STUDY

The period of this study (1921 through 1923) was one of general agricultural depression. Agricultural prices had begun to fall during the later part of 1920 and reached the low point during the summer of 1921. Beef-cattle prices began their decline with other farm products but did not reach their low point until the late fall and winter of 1921, the low point coming at about the time most of the Kansas cattle had to move off grass. (Fig. 9.) The relatively low sale price of those cattle leaving the pastures in 1921 more than offset all economies that could be made in production. By the summer of 1922 the general depression in agriculture had begun to make itself felt in prices that had to be paid for things purchased by farmers.

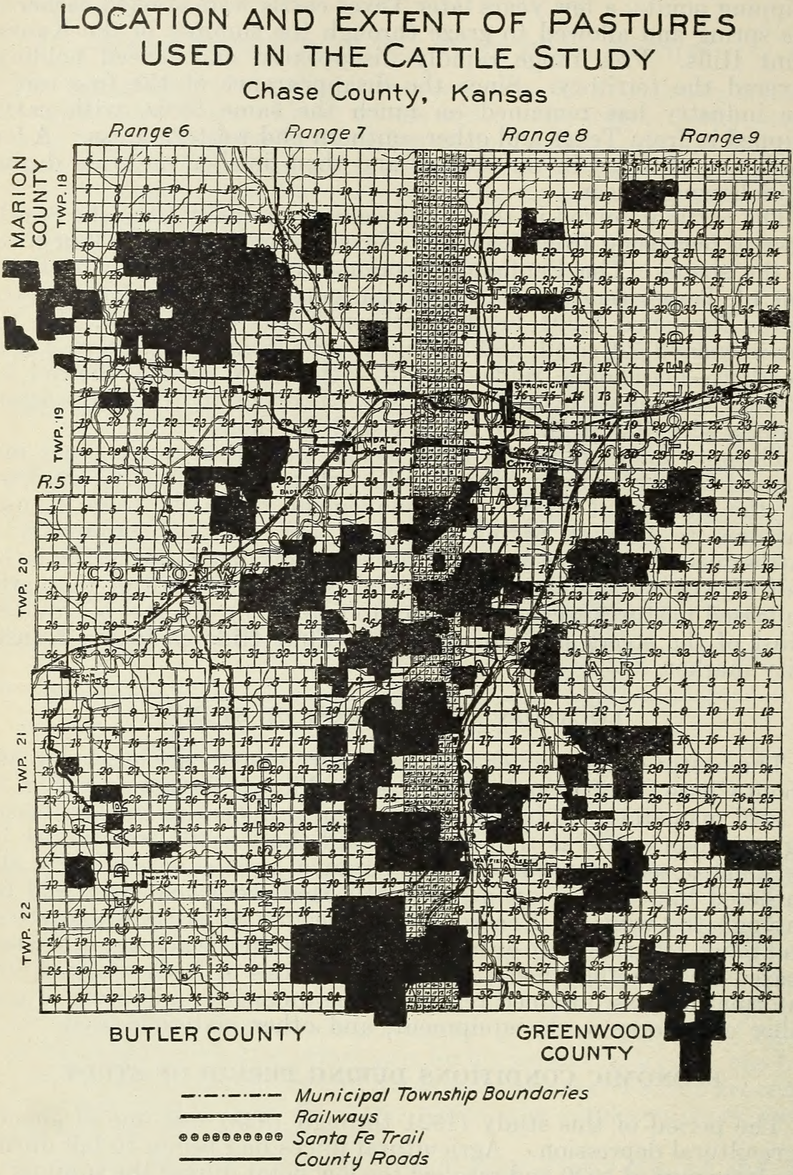

FIG. 2.—The black areas are the pastures covered in this study

In that year the grass cost was lower, the labor charges less, and the initial cost of the steers nearer the prices at which these steers were finally sold.

In agriculture generally the year 1923 was one of improvement in the prices of things the farmer sells and a slight reduction in the cost of things the farmer has to buy in order to continue producing. This situation was just reversed in the Kansas grass section. Cattlemen shipping cattle to these pastures had to pay more for their grass than the year previous. Labor was relatively higher. And the prices of southwestern steers, at the time they went on grass in Kansas, had advanced somewhat over the previous spring. In the face of these conditions, range and grass-fat cattle did not hold their normal price relationships on the market in comparison to corn-fed cattle, and although the general price level of corn-fed cattle held steady during 1923 the prices of Kansas grass-fat cattle and range cattle, generally were weak.

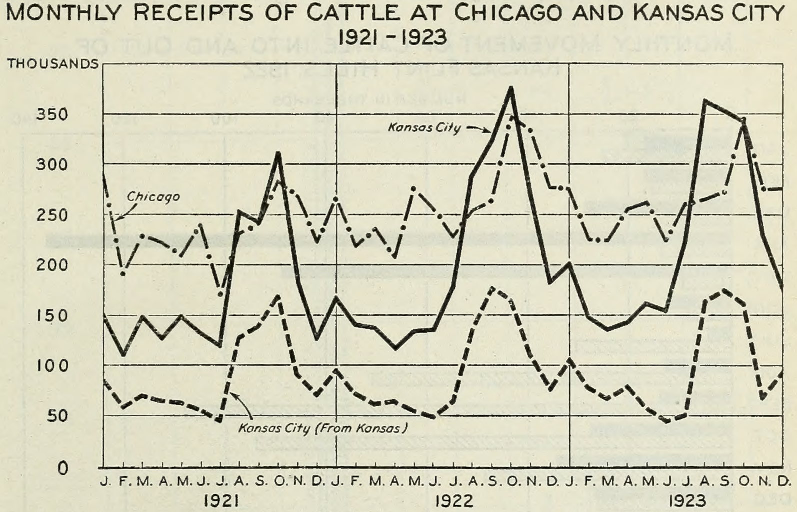

FIG. 3.—There is a wide variation at different times during the year in the numbers of cattle received at Kansas City as compared with Chicago and in the proportion of the Kansas City cattle that come from Kansas

INFLUENCE OF MOVEMENT OF KANSAS GRASS CATTLE ON THE MARKET

Since 1920 the State of Kansas has supplied approximately 40 per cent of all cattle and calves marketed in Kansas City. This movement of cattle from the State of Kansas into Kansas City assumes varying proportions of each month's receipts as is shown in Figure 3. During the period of light cattle receipts extending from early December to early May, cattle coming from the feed lots of eastern Kansas make up close to one-half the Kansas City receipts. In May the movement of Kansas cattle usually begins to drop off and does not recover until grass cattle begin to move in July. During August, September, October, and November, months of heavy western-range cattle movements, Kansas cattle again assume an important influence on the Kansas City market, their shipments from this State again approximating from two-fifths to one-half of the total receipts. The State of Kansas markets more cattle during the months that its grass cattle move to market (July, August

September, October, and November) than any other State. Texas is the only State that approximates the Kansas movement. The big jump in Kansas City receipts in August and the following three months is due in large degree to the movement of Kansas cattle. Kansas grass-fat steers going to market in July are usually sold for slaughter, whereas in the months following only the best and fleshiest steers are purchased by the packers unless there is a very strong demand for cattle for slaughter.

Since Kansas grass cattle play so large a part in the receipts at the Kansas City market, it is natural to believe that the movement of prices on this market, while these cattle are being absorbed, is influenced by the volume of receipts and the kind of cattle placed on sale. Each year of this study, as the grass-fat Kansas cattle began arriving on the market in early July, there was a general tendency for the Kansas City cattle prices, of the classes into which these grass-fat cattle fell, to advance somewhat above the prices paid for cattle of similar classes during the months just previous. When the general movement of western-range cattle gets well under way in August and September and the fleshier Kansas cattle are pretty well disposed of, the market declines.

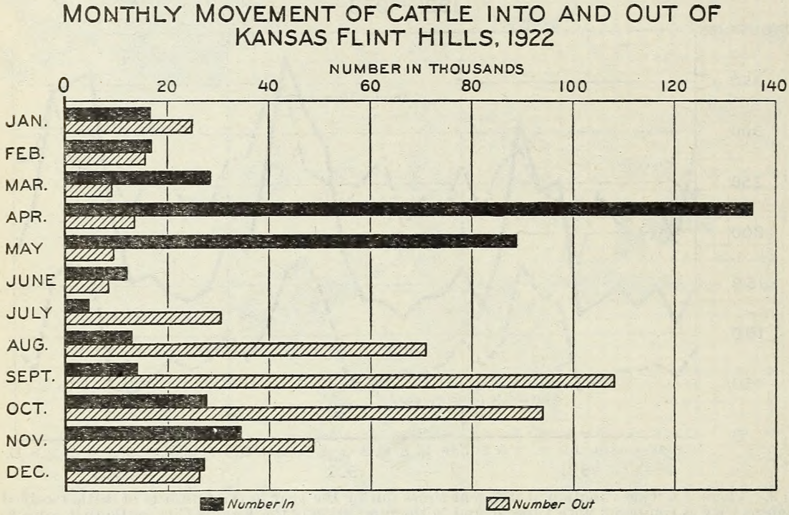

FIG. 4.—Cattle move in and out of the Flint Hills every month in the year but the peak of the in movement is in the spring and of the out movement in the fall

Cattle move to the Flint Hills pastures during April and early May, with a few scattering droves turned out to graze in late March. (Figs. 4 and 5.) The condition of the pastures, the cattle, and the market determine the time of movement off grass. The unfavorable market of 1921 caused a holding back of cattle, although pastures began to dry up somewhat earlier than usual. It was not until well into August of 1921 that grass cattle began their movement to market. The year 1922 was a good grass year and the cattle market was beginning to recover slowly from the low prices of the previous winter. The last two weeks of July saw the movement begin, in 1922, with the peak of the movement in late September. Exceptionally dry weather during late July and early August of the summer of 1923 started cattle to market earlier that year with the heavy shipments coming in August and September. The movement of all cattle in and out of the Kansas grass area during 1922 is shown in Figure 4. During this year the share of all Kansas City cattle coming from the the State of Kansas follows almost identically the movement of cattle from the Flint Hills. By comparing the movement of cattle out of the Flint Hills as shown in Figure 4 with the number of Kansas City cattle coming from the State of Kansas shown in Figure 3 the striking similarity of these two movements is apparent.

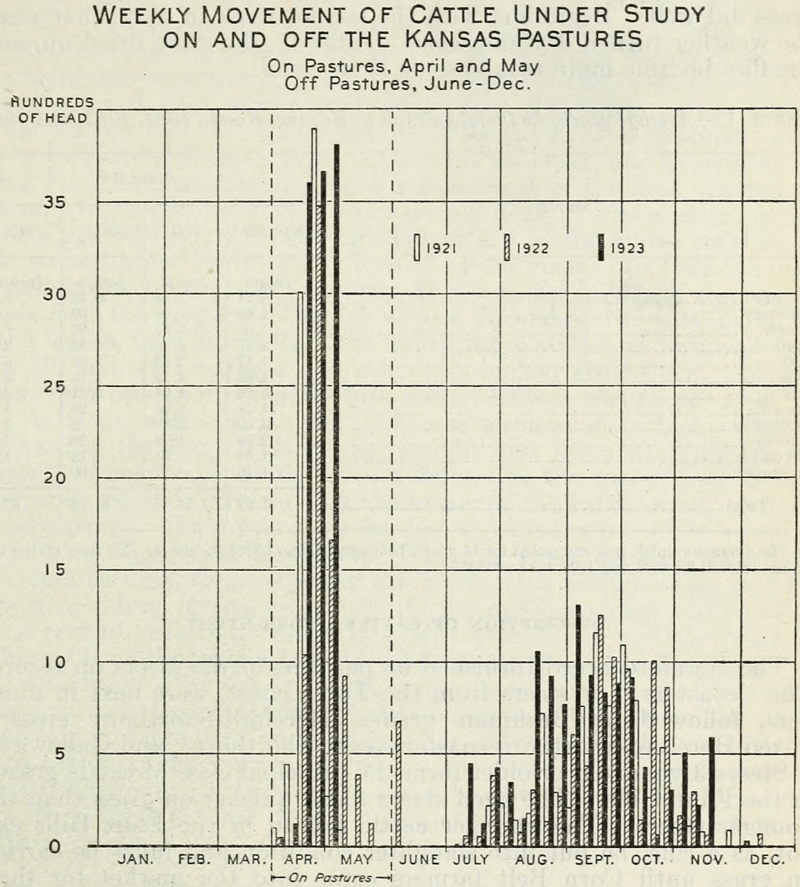

FIG. 5.—The movement onto the pastures is confined to about three weeks in April and May, but the movement off these pastures is spread over several months

WEATHER AND PASTURE CONDITIONS DURING PERIOD OF STUDY

Physical conditions during these three years were typical of usual conditions in the cattle country of Kansas. While there was no year in which drought resulted in early drying up of the pastures, there was no exceptionally good year for the grass with frequent rains throughout the spring and summer months and green grass until late in the fall. In 1921 the grass began to dry up a little earlier than usual. The stock water available in that year was less than is usually available during the latter part of the grazing period. In 1922 conditions were better in these respects; the grass got a good start in the spring and grew until fairly late in the season. Stock water was abundant at all times. In 1923 a late spring retarded the growth of the grass and shortened the grazing season; there was an abundant supply of moisture in the early summer months and the grass did well. Beginning with the second week in July, that year, the weather turned dry and warm (Table 1), the grass dried up, and the flies became more troublesome than usual.

TABLE 1.—*Average yearly and total rainfall at Bazaar, Kans., 1921, 1922, and 1923*

Month	Rainfall			
	Average[1]	1921	1922	1923
	Inches	*Inches*	*Inches*	*Inches*
January	0.74	1.23	0.40	0.01
February	1.68	.26	1.09	.07
March	1.69	2.67	4.95	1.98
April	2.37	2.35	6.42	2.33
May	5.11	2.53	2.91	6.05
June	4.04	4.25	1.18	8.63
July	3.86	1.94	4.41	2.78
August	4.21	2.96	1.25	1.67
September	3.02	3.88	3.96	3.52
October	2.39	1.78	1.28	4.19
November	1.64	.01	4.13	1.27
December	1.16	.27	.00	.75
Total	31.91	24.13	31.98	33.25

[1] The average rainfall was computed for 14 years, between 1905 and 1920 inclusive. No data giving the annual rainfall for 1906 and 1908 were available.

DESCRIPTION OF CATTLE UNDER STUDY

The Hereford breed furnished 68 per cent of the steers on record. The "coasters," or steers from the Texas coast, were next in numbers, followed by Brahman grades, Hereford-Shorthorn crosses, mixed Hereford-Shorthorn coaster steers, Shorthorns, and Galloways.

Steers 3 years old or older form the principal class of cattle grazed in the Flint Hills. The aged steers finish quicker on grass than the younger steers. The younger cattle grazed in the Flint Hills can not, as a rule, be put into slaughter condition and must be carried on grass until Corn Belt farmers come into the market for their feeders. This necessitates keeping the young cattle on grass into September and October, which is usually a season of poorer grass than the late spring and summer.

For the purposes of study, steers that had nothing but grass have been divided into classes by age and the degree of finish on them when they went on grass. In addition to the straight grass cattle some data were obtained upon cattle fed while on pasture and upon cow herds. The general divisions of these classes are as follows: (1) Thin aged steers; (2) half-fat aged steers; (3) fat aged steers; (4) thin 2-year-old steers; (5) half-fat 2-year-old steers; (6) thin yearling steers; (7) half-fat yearling steers; (8) aged steers fed while on grass; (9) 2-year-old steers fed on grass, and (10) breeding cows.

METHODS OF LEASING PASTURES

Many of the cattle coming into the Flint Hills are dropped off for the summer pasture in transit to market from Texas and other southwestern States, and are received, cared for, and shipped out by the local renters or owners of the grass who in turn contract with the owner of the cattle at a stipulated sum per steer for the use of grass and for any services which the holder of grass may agree to furnish along with it. The terms of the grazing leases are not uniform. In practically every lease a stated amount is paid for the privilege of grazing each steer as long as the owner wishes during the grazing season which on many leases ends October 15; but cattle may be removed from the pasture whenever the cattle owner wishes. The counting of the steers, responsibility for strayed or stolen cattle, the furnishing of salt, caring for fences, watering, and otherwise caring for the cattle, together with a statement of the area allotted per steer are details which vary from lease to lease. The charge for each steer grazed varies, depending upon which of the above services are to be performed by the party furnishing the grass. In 1921 the usual leasing rate for mature steers was $8 where the holder of the pasture assumed the responsibility for strays, furnished the salt, cared for the fences, took steers from the unloading station and returned them in the fall, and watered and otherwise looked after them. In 1922 this rate was approximately $10, and in 1923 it was $9 per steer.

As there is so wide a variety of lease terms under which cattle are grazed in the Flint Hills it was thought best when studying the elements of cost to separate out and determine the cost of each item of expense whether furnished by the owner of the cattle or the owner of the pasture. This was done so that a comparative study could be made of these cost elements. Where a lease contract called for certain services to accompany the grass, such as furnishing salt and salting, riding fences, responsibility for missing steers and the like, the cost of each of these services was determined and the total deducted from the lease rate per steer to obtain the charge for grass. All expenses borne by the owner of cattle, in addition to the lease, were determined; these include interest on capital tied up in the cattle while they were held on grass and any services that he, as owner of the cattle, might have to furnish. This permits the cost of carrying cattle under every type of lease to be compared with those costs incurred by a pasture owner or holder who may use his pastures to graze his own cattle.

GAINS AND PASTURE AND LABOR REQUIREMENTS OF PRODUCTION

Thin aged steers with less grass per head than the fat aged steers made nearly twice the gain in weight; thin aged steers making 297 pounds gain on 4.4 acres of grass (average of 1921, 1922, and 1923), and fat aged steers gaining only 162 pounds per season on 4.7 acres (average 1921 and 1923). (Table 2.) On the other hand, the half-fat younger cattle showed a tendency to gain more than the thin young cattle. The more flesh the steers carried, when turned on grass, the greater was the pasture allotted to them. This of course, was done to hold the flesh the steers already had and to give them all the pasture needed to put them in killing condition in July and August, or before the general movement of grass cattle started toward market.

Although there was some variation from one year to the next in the quantity of beef produced per acre by each of the classes of cattle under study, no one of the three years appears to have been exceptionally favorable or unfavorable to all classes. (Figs. 6 and 7.)

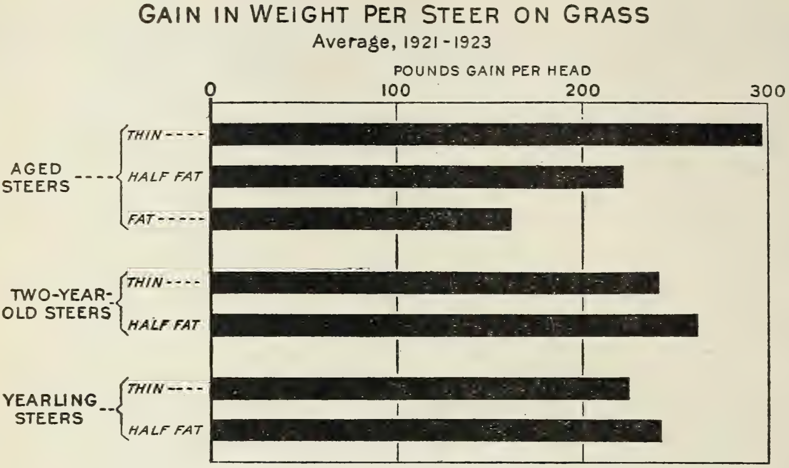

FIG. 6.—The gain in weight per steer on grass varies considerably as between kinds of steers

There was slight relation between the age of the steer and the acres of grass allotted. Thin yearling steers got slightly fewer acres per head than thin 2-year-olds and older cattle. The thin aged steers usually had from 4 to 5 acres of grass per head. Thin 2-year-old steers had about the same area as thin aged steers, and thin yearlings had from 3 to 4 acres per head.

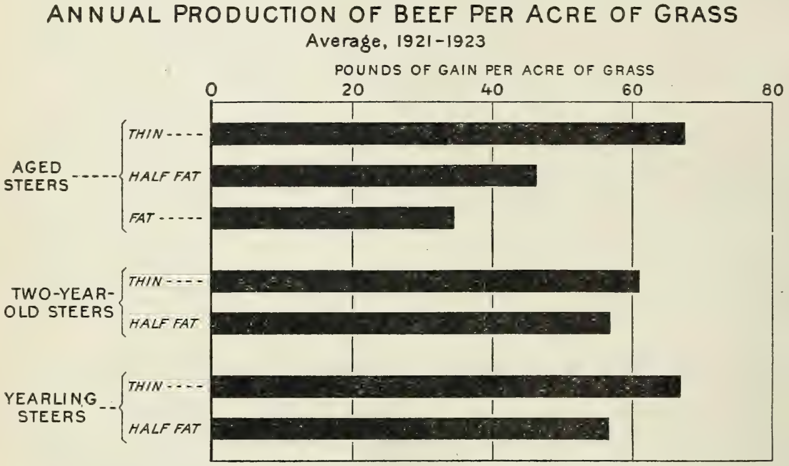

FIG. 7.—The annual production of beef per acre of grass varies as between kinds of steers

Thin aged steers made greater daily gains than the other classes of cattle. They had fewer acres per head than the half-fat aged or the fat aged steers but made more rapid gains. The thin aged steers gained more than 2 pounds per day each year. No other class of straight grass cattle gained as much as 2 pounds daily in any season.

The fat aged steers made the lowest daily gain in 1921, the thin 2-year-old steers were lowest in 1922, and the half-fat yearlings showed the least daily gain in 1923. Thin 2-year-old steers ordinarily gain more rapidly than did those under study in 1922, as there were among them that year some steers of very low quality. Table 2.

The pastures used by the older steers were farther away from the owner's or caretaker's house, and were put to little or no use after these steers were gone. This allowed the grass to recuperate somewhat in the fall, since most of the aged steers went to market in July, August, or September. These pastures, not being grazed so long or so closely, were able to carry more steers the succeeding season than if the pasturing season had been long and the grass closely grazed.

The young cattle were grazed nearer the farmstead and three to six weeks longer than the older cattle, thus keeping the pastures eaten down later in the fall. Often these pastures were used by cattle and horses during the fall and winter, which tended to reduce the stand of grass and retard the next season's growth. The fact that the young cattle used almost as many acres per head as the aged steers is partly accounted for by the condition of the pastures on which the young steers were grazed.

Labor was used mainly for riding and fixing fences, salting, driving cattle to and from the loading station, and counting cattle. There were wide differences in the amounts of man labor and horse work used, but generally the younger cattle required the more labor, for the reason that these steers were in smaller herds and in smaller pastures. The older cattle, as a rule, were in larger herds and larger pastures and were farther away from the house of the caretaker, consequently did not use as much time per head. The size of the herd is the most important factor affecting the amount of labor required per head.

TABLE 2.—*Gain, pasture, and labor requirement of cattle grazed on pastures in Chase County, Kans., in 1921, 1922, and 1923*

Item	Class of steers by year									
	Thin aged steers			Half-fat aged steers			Fat aged steers [1]		Thin 2-year-old steers [2]	
	1921	1922	1923	1921	1922	1923	1921	1923	1922	1923
Number of head	4, 268	5, 459	7, 032	879	193	562	541	672	301	923
Number of herds	10	15	13	8	2	6	5	7	3	5
Average number per herd	427	364	541	110	96	94	108	96	100	185
Pasture record:										
Days on grass	145	144	133	135	150	128	137	115	184	132
Out weight [3] ... pounds	1, 132	1, 017	1, 029	1, 115	1, 250	1, 019	1, 280	1, 183	846	798
Initial weight ... do	827	723	736	887	1, 046	786	1, 123	1, 016	596	566
Gain per season ... do	305	294	293	228	204	233	157	167	250	232
Gain per day ... do	2. 10	2. 04	2. 20	1. 69	1. 36	1. 82	1. 15	1. 45	1. 36	1. 76
Acreage per head ... acres	4. 58	4. 17	4. 49	4. 82	5. 79	4. 15	4. 92	4. 51	4. 22	3. 68
Gain in beef per acre ... pounds	66. 6	70. 5	65. 3	47. 3	35. 2	56. 1	31. 9	37. 0	59. 2	63. 0
Acreage producing 100 pounds gain ... acres	1. 50	1. 42	1. 53	2. 11	2. 84	1. 78	3. 13	2. 70	1. 69	1. 59
Labor per month per 100 head:										
Man labor ... hours	20. 8	24. 6	21. 6	44. 3	68. 4	30. 6	47. 2	42. 1	35. 4	22. 2
Horse work ... do	20. 6	24. 1	20. 9	32. 1	64. 3	30. 5	48. 3	39. 9	41. 6	21. 1

[1] None in 1922.

[2] None in 1921.

[3] The out weight is the total weight of the cattle on leaving the pastures whether sold or lost by death. This weight is given on a Kansas City basis (allowing for shrink on steers that did not leave Chase County).

TABLE 2.—*Gain, pasture, and labor requirement of cattle grazed on pastures in Chase County, Kans., in 1921, 1922, and 1923*—Continued

Item	Class of steers by year							
	Half-fat 2-year-old steers			Thin yearling steers[1]		Half-fat yearling steers		
	1921	1922	1923	1921	1923	1921	1922	1923
Number of head	341	768	155	272	40	155	131	244
Number of herds	4	5	2	2	1	3	1	3
Average number per herd	85	154	78	136	40	52	131	81
Pasture record:								
Days on grass	165	175	155	160	168	184	169	187
Out weight[2] pounds	972	973	912	635	595	766	769	718
Initial weight do	705	685	679	390	389	490	511	525
Gain per season do	267	288	233	245	206	276	258	193
Gain per day do	1. 62	1. 65	1. 50	1. 53	1. 23	1. 50	1. 53	1. 03
Acreage per head acres	4. 75	4. 11	5. 22	3. 01	3. 93	4. 79	4. 03	4. 00
Gain in beef per acre pounds	56. 2	70. 1	44. 6	81. 4	52. 4	57. 6	64. 0	48. 2
Acreage producing 100 pounds gain acres	1. 78	1. 43	2. 24	1. 23	1. 91	1. 74	1. 56	2. 07
Labor per month per 100 head:								
Man labor hours	52. 5	21. 8	52. 3	16. 5	81. 6	34. 6	29. 3	20. 5
Horse labor do	44. 9	26. 5	52. 5	12. 7	63. 8	21. 4	29. 3	18. 1

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[1] None in 1922.

[2] The out weight is the total weight of the cattle on leaving the pastures whether sold or lost by death. This weight is given on a Kansas City basis (allowing for shrink on steers that did not leave Chase County).

COST OF CARRYING STEERS ON GRASS

The grass cost per head, as given in Table 3, is the amount paid for grass used by each steer during the grazing season. From the lease fee has been subtracted the cost of all items other than grass and the balance used as the "grass cost." Where the owner of the cattle also owned the grass, the steers are charged with the amount that could be obtained for the grass, if the pasture has been leased. The other cost items are figured at current rates for services performed. Table 3 gives the details of costs by kinds of cattle yearly. Cattle of every age and degree of flesh were not always brought into the Flint Hills every year and studied, and so figures can not be given for every kind of cattle every year.

Yearlings had the lowest carrying charge per head, owing principally to lower grass requirements and a lower capital investment per steer upon which interest was charged. The higher carrying costs for the aged steers came from a higher capital investment and larger grass area used per steer. The few herds of thin 2-year-old steers in 1922 and 1923 had, in the first year, a carrying charge of $10.93, and in the second year, $10.70 per head. Half-fat 2-year-old steers had a carrying charge of $11.75 in 1921, $10.12 in 1922, and $12.48 in 1923.

The cost of carrying thin, aged cattle on grass averaged $12.43 a head for 10 herds in 1921, $10.68 a head for 15 herds in 1922, and $10.91 a head for 13 herds in 1923. Of these annual carrying costs, the grass charge approximated 75 per cent. The next cost item in order of importance, was interest upon the investment in cattle, which varied with the value of the cattle when going on grass, and the length of time they were held there. Man labor, horse work, loss from death of steers, and miscellaneous upkeep items made the remainder. The half-fat, aged steers were carried for approximately the same cost as the thin, aged steers. The cost of carrying a fat, aged steer for the season was $13.08 in 1921 and $12.36 in 1923.

TABLE 3.—*Initial and carrying cost of steers on pastures in Chase County, Kans., in 1921, 1922, and 1923*

Item	Thin aged steers			Half-fat aged steers			Fat aged steers [1]		Thin 2-year-old steers [2]	
	1921	1922	1923	1921	1922	1923	1921	1923	1922	1923
Number of head	4,268	5,459	7,032	879	193	562	541	672	301	923
Number of herds	10	15	13	8	2	6	5	7	3	5
Average number per herd	427	364	541	110	96	94	108	96	100	185
Carrying costs per head:										
Grass	$9.48	$7.75	$8.14	$8.08	$6.29	$7.73	$8.70	$8.02	$7.39	$8.19
Interest on cattle	1.85	1.71	1.69	2.08	2.62	1.83	2.40	2.23	1.56	1.39
Labor—man and horse	.39	.42	.46	.71	1.29	.51	.83	.60	.83	.38
Death loss	.09	.44	.13	.09	------	.11	.29	.13	.18	.31
Other costs	.62	.36	.49	.85	1.22	.56	.86	1.38	.97	.43
Total carrying costs per head	12.43	10.68	10.91	11.81	11.42	10.74	13.08	12.36	10.93	10.70
Initial cost per head	58.48	55.21	55.38	69.44	78.67	65.11	79.38	84.90	41.42	47.71
Total cost at shipping point	70.91	65.89	66.29	81.25	90.09	75.85	92.46	97.26	52.35	58.41
Marketing charge (for those marketed)	4.69	3.57	2.85	3.45	3.79	3.19	4.28	3.24	2.94	2.91

Item	Half-fat 2-year-old steers			Thin yearling steers		Half-fat yearling steers		
	1921	1922	1923	1921	1923	1921	1922	1923
Number of head	341	768	155	272	40	155	131	244
Number of herds	4	5	2	2	1	3	1	3
Average number per herd	85	154	78	136	40	52	131	81
Carrying costs per head:								
Grass	$7.36	$6.99	$6.83	$4.65	$6.00	$4.46	$6.06	$6.51
Interest on cattle	1.96	1.79	2.04	.98	1.01	1.18	1.33	1.77
Labor—man and horse	1.08	.51	1.65	.32	1.34	.76	.66	.48
Death loss	.16	.19	.46	.09	1.84	------	------	------
Other costs	1.19	.64	1.50	.32	.62	.29	.46	.30
Total carrying costs per head	11.75	10.12	12.48	6.36	10.81	6.69	8.51	9.06
Initial cost per head	54.10	51.11	52.64	27.87	35.07	28.67	40.19	43.92
Total cost at shipping point	65.85	61.23	65.12	34.23	45.88	35.36	48.70	52.98
Marketing charge (for those marketed)	3.15	------	2.82	------	------	------	------	3.45

[1] None in 1922.

[2] None in 1921.

The higher carrying costs for the aged steers (Table 3) were caused by the higher initial investment in them, with the consequent higher interest charge, and by the larger area of grass allowed these steers, as compared with the younger cattle, which was reflected in the lease charge per head. There was no uniform variation in the other items of cost, between the various classes of cattle.

The size of the herd was the most important factor affecting the labor cost in caring for them. Within reasonable limits, the larger the herd the more steers one man can care for. Most of the herds of younger steers were smaller than the herds of older steers, so that the labor cost was greater for the younger steers. Other factors affecting the labor cost were the location of the pasture, the kind of water supply, the kind of cattle in the adjoining pastures, and the presence or absence of farm land adjoining the pastures. These last two factors affected the amount of fence riding and labor hunting for strays.

The length of time the steer was on grass had relatively no influence upon the amount of the cost for grass for the season. The grass charge, which was the largest cost item, was based upon the grazing season and was paid in full, even though the steer was on the grass only a part of the season. Interest and labor costs accumulated as the grazing period was lengthened. The loss from death and other costs were not affected by the length of the grazing period except that the chances of death or loss from other causes were extended to each additional day.

Marketing has not been included as one of the carrying costs. It is shown separately from the carrying costs, as many of the steers under study had no marketing cost. They were sold in the pasture and driven direct to local feed lots. The marketing cost per head is based on the number actually sold. (Table 3.)

TABLE 4.—*Cost of producing 100 pounds gain on steers grazed on pastures in Chase County, Kans., in 1921, 1922, and 1923*

Item	Class of steers by years									
	Thin aged steers			Half-fat aged steers			Fat aged steers [1]		Thin 2-year old steers [2]	
	1921	1922	1923	1921	1922	1923	1921	1923	1922	1923
Grass	$3.10	$2.64	$2.78	$3.53	$3.09	$3.32	$5.53	$4.81	$2.96	$3.54
Salt	.01	.01	.02	.02	.02	.02	.02	.02	.01	.03
Man and horse labor	.13	.14	.16	.31	.63	.22	.53	.36	.33	.16
Equipment charge	.06	.08	.09	.18	.16	.11	.21	.20	.11	.08
Death loss	.03	.15	.04	.04	------	.05	.18	.08	.07	.13
Interest on cattle	.60	.58	.58	.91	1.29	.78	1.52	1.34	.62	.60
Other costs	.13	.04	.05	.17	.42	.11	.31	.60	.34	.19
Total	4.06	3.64	3.72	5.16	5.61	4.61	8.30	7.41	4.44	4.73

Item	Class of steers by years							
	Half-fat 2-year-old steers			Thin yearling steers [1]		Half-fat yearling steers		
	1921	1922	1923	1921	1923	1921	1922	1923
Grass	$2.76	$2.43	$2.94	$1.90	$2.77	$1.62	$2.34	$3.37
Salt	.03	.02	.03	.01	.03	.01	.03	.02
Man and horse labor	.41	.18	.71	.13	.65	.28	.26	.25
Equipment charge	.18	.08	.16	.12	.16	.09	.06	.12
Death loss	.06	.07	.15	.04	.89	------	------	------
Interest on cattle	.74	.62	.88	.40	.49	.43	.58	.92
Other costs	.23	.12	.45	------	.11	------	.09	.01
Total	4.41	3.52	5.32	2.60	5.10	2.43	3.36	4.69

None in 1922.

[2] None in 1921.

FACTORS INFUENCING PROFIT OR LOSS IN GRAZING CATTLE

Continued utilization of the Flint Hills pastures for the grazing of steers is dependent upon the long-time financial success of this method of using the pastures compared with other possible uses for them. The factors measuring success in handling grass cattle in this section do not differ materially from those affecting the fattening of cattle in the feed lot, except that where the only feed is grass, care and skill in feeding does not play so important a part. From a detailed analysis[1] of the thin aged cattle under study the factors influencing the financial success in handling these cattle were found to be (1) the general movement of cattle prices each year from March through November, whether upward or downward. This general price movement is the principal determinant of (2) the margin received. The term "margin" as used here is the difference between the value of the steer per hundred pounds when going on grass and the selling price per hundred pounds. Since most of the steers using the Flint Hills pastures during the years of this study put on gain (see Tables 4 and 5) for less than the sales price per hundred pounds of the steer the margin could be a minus quantity and the steers sell at a profit. However, the smaller the minus margins and the larger the plus margins the greater the profit.

The (3) cost of carrying a steer through the season, which includes the cost of grass, the interest on capital tied up in cattle, the equipment, labor, and other charges, had about one-third as much influence upon the profit from handling of thin aged steers as did the margin received, but there was a general tendency for those steers having the higher carrying charges to return the lower incomes. (Fig. 8.)

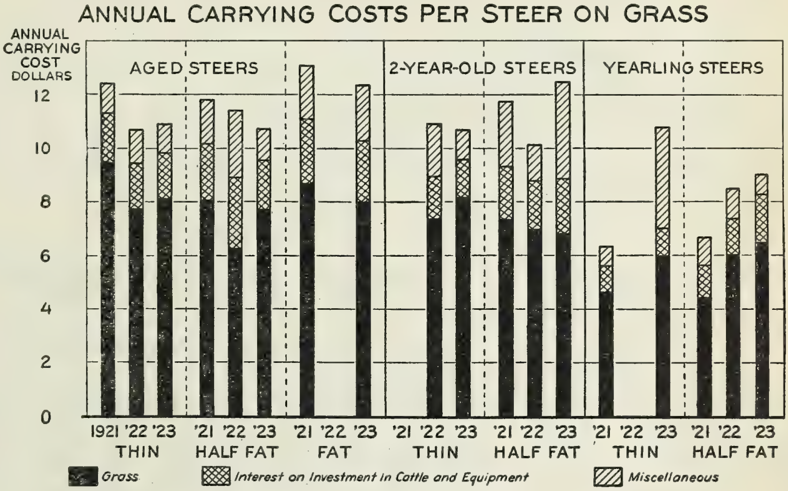

FIG. 8.—Carrying costs per steer on grass vary considerably

It was also noticeable that (4) the thin aged steers held longer on grass made lower returns than those on grass a shorter time. There was a marked tendency for those cattlemen who paid the least for each acre of grass they used to have the larger net income. One reason for this was that the leases covering pasture for cattle sold early in the season usually called for less area but for the better grass. Cattlemen planning to pasture their cattle for longer periods usually demanded more area per steer than those planning for a short grazing period. Another reason why longer grazing of thin aged cattle meant lower incomes was that during the period of this study the thin aged steers marketed early in the season obtained a larger margin than the thin aged steers marketed later. This was due to the movement of cattle prices during the summer as shown in Figure 9.

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[1] The measure of the relative importance of the different factors influencing the financial success was determined by a statistical analysis which showed how closely the net income varied with each factor influencing financial success when the influences of all other causal factors were eliminated.

Other factors in the grazing of thin aged steers that had some influence upon the profits in the business were (5) the weight of the steer for the heavier steers, in the manner these were handled, usually made more money; and (6) since the early shipments turned out the best, the quantity of gain and the cost of this gain had little if any influence upon the profitableness of the business.

TABLE 5.—*Profit, losses, margins, and cost of gain on steers on pastures in Chase County, Kans., in 1921, 1922, and 1923*

Item	Class of steers by years									
	Thin aged steers			Half-fat aged steers			Fat aged steers [1]		Thin 2-year-old steers [2]	
	1921	1922	1923	1921	1922	1923	1921	1923	1922	1923
Total cost per head [3]	$75.12	$69.45	$68.98	$82.41	$93.88	$78.21	$96.74	$100.20	$54.42	$60.02
Total receipts per head	67.94	67.75	66.60	68.34	103.13	72.86	92.29	96.82	54.68	54.73
Profit or loss per head	−7.18	−1.70	−2.38	−14.07	9.25	−5.35	−4.45	3.38	.26	−5.29
Initial price per cwt	7.07	7.64	7.52	7.83	7.52	8.28	7.07	8.36	6.95	8.43
Sales price per cwt	6.01	6.65	6.46	6.12	8.24	7.15	7.21	9.35	6.44	6.85
Margin received per cwt	−1.06	−.99	−1.06	−1.71	.72	−1.13	.14	.99	−.51	−1.58
Cost of 100 pounds gain [4]	4.06	3.64	3.72	5.16	5.61	4.61	8.30	7.41	4.44	4.73

Item	Class of steers by years							
	Half-fat 2-year-old steers			Thin yearling steers [1]		Half-fat yearling steers		
	1921	1922	1923	1921	1923	1921	1922	1923
Total cost per head [3]	$68.81	$61.23	$65.43	$34.27	$46.31	$35.36	$48.70	$53.26
Total receipts per head	61.08	69.80	58.28	39.33	40.18	42.37	58.46	50.88
Profit or loss per head	−7.73	8.57	−7.15	5.06	−6.13	7.01	9.76	−2.38
Initial price per cwt	7.67	7.46	7.75	7.15	9.02	5.85	7.86	8.37
Sale price per cwt	6.28	6.89	6.38	6.18	6.65	5.52	7.60	7.08
Margin received per cwt	−1.39	−.57	−1.37	−.97	−2.37	−.33	−.26	−1.29
Cost of 100 pounds gain [4]	4.41	3.52	5.32	2.60	5.10	2.43	3.36	4.69

[1] None in 1922.

[2] None in 1921.

[3] This total is not the same as that used in Table 3. The total in this table is the actual cost per head, including marketing costs on part of the cattle, whereas the total used in Table 3 is the average cost per head at the shipping point.

[4] At shipping point.

Yearlings were less speculative than the older steers during the period of this study. Although the average loss figure for the older cattle does not mean that every herd was handled at a loss, it indicates that the older animals as a rule were not as profitable as yearlings. Another advantage in favor of the young cattle, as shown in Table 5, is that less capital is required in stocking pastures with them than with the older kind. Wherever sufficient winter forage is available to maintain breeding herds in the Flint Hills the growing of yearlings has advantages over the handling of older steers. There is good opportunity for a portion at least of these yearlings to be produced within this section.

TABLE 6.—*Carrying capacity, investment, and carrying costs per 100 acres of grass grazed on pastures of Chase County, Kans., in 1921, 1922, and 1923*

Item	Class of steers by years							
	Thin aged steers			Half-fat aged steers			Fat aged steers [1]	
	1921	1922	1923	1921	1922	1923	1921	1923
Number of steers per 100 acres	21.8	24.0	22.3	20.7	17.3	24.1	20.3	22.2
Initial weight of steers per 100 acres, pounds	18,029	17,352	16,413	18,361	18,096	18,943	22,797	22,577
Gain in weight of steers per 100 acres, pounds	6,649	7,056	6,534	4,720	3,529	5,615	3,187	3,707
Cost per 100 acres:								
Grass for steers	$206.66	$186.00	$181.52	$167.25	$108.82	$186.29	$176.61	$178.04
Labor—man and horse	8.50	10.08	10.26	14.70	22.32	12.29	16.85	13.32
Interest charge	40.33	41.04	37.69	43.06	45.33	44.10	48.72	49.50
Death loss	1.96	10.56	2.90	1.86	--------	2.65	5.89	2.89
Other costs	13.52	8.64	10.93	17.60	21.10	13.50	17.46	30.64
Total carrying costs per 100 acres	270.97	256.32	243.30	244.47	197.57	258.83	265.53	274.39
Initial cost of steers per 100 acres	1,274.87	1,325.04	1,234.97	1,437.41	1,360.99	1,569.15	1,611.41	1,884.78
Total cost and investment per 100 acres	1,545.84	1,581.36	1,478.27	1,681.88	1,558.56	1,827.98	1,876.94	2,159.17

Item	Class of steers by years									
	Thin 2-year-old steers [2]		Half-fat 2-year-old steers			Thin yearling steers [1]		Half-fat yearling steers		
	1922	1923	1921	1922	1923	1921	1923	1921	1922	1923
Number of steers per 100 acres	23.7	27.2	21.1	24.3	19.2	33.2	25.4	20.9	24.8	25.0
Initial weight of steers per 100 acres, pounds	14,125	15,395	14,805	16,646	13,037	12,948	9,881	10,241	12,673	13,125
Gain in weight of steers per 100 acres, pounds	5,925	6,283	5,607	6,974	4,474	8,134	5,232	5,768	6,398	4,825
Cost per 100 acres:										
Grass for steers	$175.14	$222.76	$155.29	$169.86	$131.13	$154.38	$152.40	$93.22	$150.29	$162.75
Labor, man and horse	19.67	10.34	22.79	12.39	31.68	10.62	34.04	15.88	16.37	12.00
Interest charge	36.97	37.81	41.36	43.50	39.17	32.54	25.65	24.66	32.98	44.25
Death loss	4.27	8.43	3.38	4.62	8.83	2.99	46.73	--------	--------	--------
Other costs	22.99	11.70	25.11	15.55	28.80	10.62	15.75	6.06	11.41	7.50
Total carrying costs per 100 acres	259.04	291.04	247.93	245.92	239.61	211.15	274.57	139.82	211.05	226.50
Initial cost of steers per 100 acres	981.66	1,297.71	1,141.51	1,241.97	1,010.69	925.28	890.78	599.20	996.71	1,098.00
Total cost and investment per 100 acres	1,240.70	1,588.75	1,389.44	1,487.89	1,250.30	1,136.43	1,165.35	739.02	1,207.76	1,324.50

[1] None in 1922.

[2] None in 1921.

CARRYING CAPACITY, STEER INVESTMENT, AND CARRYING COSTS PER 100 ACRES OF GRASS

The number of steers that can be grazed on 100 acres of grass, the investment tied up in cattle, and the differences in the total carrying costs should receive careful consideration in deciding upon the class of steers to handle. Table 6 gives these items for the grass cattle included in this study. The number of thin aged steers per 100 acres of grass varied from 21.8 to 24. The tendency was to carry fewer half-fat and fat aged steers per 100 acres of grass than of the thin aged steers, although in 1923 there were 24.1 half-fat aged steers for each 100 acres of grass. There were more of the younger steers for each hundred acres of grass, the number of thin 2-year-old steers being 23.7 and 27.2 steers and the thin yearling steers 33.2 and 25.4 steers per 100 acres. As was true of the aged steers, the young steers carrying more flesh had more grass than did the thin young steers. In many instances the younger steers were grazed on poorer pastures than the aged steers and this in part accounts for the small difference between the classes.

In general, the thin cattle made more beef from 100 acres of grass than the cattle carrying more flesh. The gains for the thin aged steers annually were 6,534 to 7,056 pounds per 100 acres of grass, the thin 2-year-old steers gained 5,925 and 6,283, and the thin yearlings 5,232 and 8,134 pounds per 100 acres of grass. The gains made by each class of cattle from 100 acres of grass are shown in Table 6.

The initial cost of the steers required to stock 100 acres of grass was greatest for the fat aged steers and decreased for both thinner and younger cattle. The initial cost of the fat aged steers varied from about $1,600 to nearly $1,900 per 100 acres of grass. The initial cost of the thin aged steers averaged from $1,235 to $1,325, whereas the thin yearling steers cost an average of $891 to $925 per 100 acres of grass.

The costs of carrying the cattle on grass showed the same tendencies as the initial cost although to a lesser degree. The costs of carrying the older and the fleshier cattle tended to be greater than the costs of carrying the younger and the thinner cattle. The lighter stocking of the grass with some of the older and heavier cattle somewhat offsets this tendency. The younger cattle and the fleshier cattle were in smaller herds than the thin aged steers. These differences result in differences in cost which would not be so evident if conditions were more nearly equal for all classes of cattle.

The cattleman who had grass but only limited funds found it possible to stock the grass with steers with the least funds if he chose yearling or 2-year-old steers. Thin aged steers required less initial investment than the fleshier aged steers.

THIN AGED STEERS

Thin aged steers were the only class of cattle handled in numbers large enough to warrant a detailed analysis of the cost and income figures gathered on them. By an analysis of the grazing costs per head for thin aged steers it was found that the factors affecting the carrying costs per head in order of their importance were (1) grass cost, (2) weight of the steer when going on grass, (3) the quality of the pastures, and (4) acres per steer. There was a tendency also for the gain made per steer to decrease as the cost of grazing the steer increased. This can partially be accounted for by the fact that there was some tendency for steers having the higher grazing charges to go to market earlier than the others.

As pastures are leased at a flat rate per steer for the season and may be used by the lessee so long as he chooses without change in the lessee contract, the cost of each additional pound of gain during the summer decreased in almost direct ratio to the number of pounds gained. Although there were slight differences in the cost of grass because of the differences in bargaining abilities of stockmen, the principal factors influencing the cost of 100 pounds gain on thin aged cattle in order of their importance were (1) the gain made per steer influenced largely by the length of time they were held on grass, and (2) the initial weight of the steer. Since the heavier aged steers went to market first there was a marked tendency for the cost of 100 pounds gain to increase with heavier-weight steers. The quality of the pastures and the number of acres per steer had but slight influence upon the cost of 100 pounds gain in weight. (Fig. 9.)

FEEDING STEERS ON GRASS

The practice of feeding concentrates to cattle while on grass is confined chiefly to aged steers, although a few 2-year-old steers are occasionally fed while on grass. The steers are fed for one or more of the following reasons: To retain, during periods of drought, gains that have previously been made; to obtain greater gains or a better finish on the steers than would be obtained on grass alone; or to carry the steers in good condition till a later date when it is hoped that the market will be better. Cattle are usually fed for a short period. The time that the steers were fed while on grass varied from 8 to 85 days, with most of them fed while on grass from 20 to 50 days.

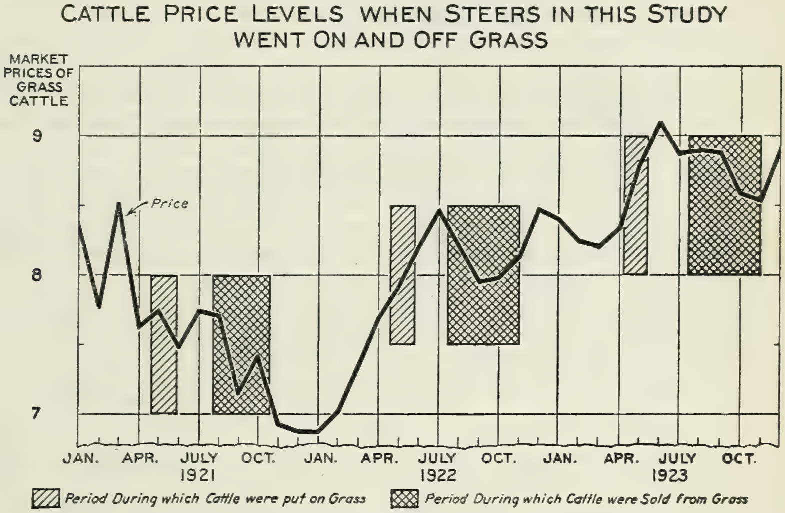

FIG. 9.—This graph shows the fluctuations in dollars per 100 pounds that occurred in the grass cattle prices during the three years of this study and the prices that existed during the time when cattle in this study were put on and taken off grass each year

During the three years of the study, records were obtained on 3,821 head of aged steers that were fed while on grass. There were 18 herds, averaging more than 200 head per herd. The herds varied in size from 60 to 490 head. These steers were heavier when going on grass in the spring than most of the straight-grass aged steers and were of good to choice quality. No common or poor steers were fed on grass. Most of the fed-on-grass steers were classed as half fat when they went on grass.

The feeds used varied in kind and quantity according to the length of feeding period and the year fed. In 1921, corn chop, ear corn, and alfalfa were the principal feeds used, with some feeders using small quantities of cottonseed cake and roughages, such as kafir fodder. In

1922, ear and shelled corn and alfalfa were the principal feeds used with very small quantities of other feeds. On the average, over the three years each one of the steers was fed 275 pounds of corn, 25 pounds of cottonseed cake, and 65 pounds of alfalfa hay.

The cost of producing 100 pounds gain (Table 7) on the steers that were fed on grass was greater than for the straight-grass steers, excepting the fat aged steers. (Table 3.) The increase in cost was due to the feed and the greater labor and interest charges. This increase in costs was partly, although not entirely, offset by the greater gains obtained.

In 1921 the aged steers lost $9.99 per head, in 1922 they made a gain of $6.69 per head and in 1923 they lost $0.87. The 2-year-old steers were fed in 1922 only, and made a profit of $10.21 per head. The margin was narrower on these cattle than on the straight-grass cattle, varying from $0.58 in 1921 to $0.25 in 1922, on the aged steers. The 2-year-old steers had a plus margin of $1.09.

One of the reasons for feeding cattle while on grass is to obtain a higher price on the market than would be paid for the straight-grass steers. The actual increase in price realized was very slight in the group of steers weighing 800 to 900 pounds when going on grass, and but little more in the group of steers weighing above 900 pounds. The average sale price per hundred pounds was as follows: 800 to 900 pound steers fed on grass sold for $7.36 as against $7.31 for the straight-grass steers. The fed-on-grass steers with initial weight of 900 pounds or more sold for $7.62 as against $7.45 for the straight grass steer, or 17 cents per hundred pounds difference.

TABLE 7.—*Gain, pasture, and labor requirement for steers fed on grass in Chase County, Kans., in 1921, 1922, and 1923*

Item	Class of steers by year			
	Aged steers			Two-year-old steers
	1921	1922	1923	1922
Number of head	1,831	493	1,497	149
Number of herds	9	4	5	2
Average number per herd	203	123	299	74
Pasture record:				
On grass alone ... days	129	149	122	136
On feed and grass ... do	44	29	22	70
Out weight, per head[1] ... pounds	1,203	1,229	1,113	1,092
Initial weight per head ... do	943	886	909	735
Gain per season ... do	260	343	204	357
Gain per day ... do	1.50	1.93	1.42	1.73
Acres per head	5.05	4.60	4.50	3.60
Labor per month on 100 head:				
Man labor ... hours	54.6	46.5	41.9	46.7
Horse work ... do	70.7	62.9	29.5	63.8
Carrying costs per head:				
Grass	$8.70	$7.17	$7.91	$6.94
Feed cost	4.67	5.12	1.38	12.37
Interest on cattle	2.67	2.54	2.26	3.40
Labor—man and horse	1.15	.98	.66	1.39
Death loss	.12	1.05	.95	--------
Other costs	.76	2.48	.61	.31
Total carrying costs per head	18.07	19.34	13.77	24.41
Initial cost per head	71.81	65.70	72.50	52.45
Total cost at shipping point—per head	89.88	85.04	86.27	76.86
Marketing charge (for those marketed)	4.68	3.68	3.25	3.52
Total receipts per head	84.57	95.41	88.65	90.59

[1] The out weight is the total weight of the cattle on leaving the pastures whether sold or lost by death. This weight is given on a Kansas City basis (allowing for shrink on steers that did not leave Chase County).

The sale price per hundred pounds necessary to meet all costs was practically the same for the fed-on-grass steers as for the straight grass cattle. The prices were for 800 pounds and below 900 pounds, fed-on-grass, $7.56; straight grass steers, $7.56. For the steers weighing more than 900 pounds, fed-on-grass, $7.80; straight grass, $7.75. The average of the steers in these two groups lost money; that is, did not return current rates for labor, interest on investment, grass charges, and all items of cash expenses, but the fed-on-grass steers did not lose so much as did the straight-grass steers. The 800 to 900 pound fed-on-grass steers lost $1.37 less than the straight-grass cattle of similar weight and the 900-pound group lost $1.50 less than the same weight of straight-grass steers.

USE OF COST DATA IN ESTIMATING FUTURE GRAZING OPERATIONS

These data may be used to estimate the price which can be paid for steers and yet handle them profitably under conditions that may exist at any future time. Every cattleman is obliged to do this in bidding for the cattle which he buys for grazing purposes. He estimates the probable gain the cattle will make, the cost of this gain and the price the cattle will bring when sold. On the basis of these estimates, he decides whether he can pay a given price for a herd of cattle. In making such estimates three things are involved: (1) The amount of the gain, (2) the cost of this gain, and (3) the margin between the purchase and the probable sale prices per hundredweight. In Table 8, data based on the records are used and combined with estimated carrying charges, to show the price which can safely be paid for cattle going on grass, or if purchased at the figure given, the price which must be obtained for them to break even when sold.

TABLE 8.—*Estimated gains, costs, and necessary margins on different classes of steers*

Item	Class of steers			
	Thin aged steers	Aged steers fed on grass	Thin 2-year-old steers	Thin yearling steers
Initial weight pounds	750	900	570	390
Estimated gain do	300	250	240	230
Out weight do	1,050	1,150	810	620
Estimated purchase price per 100 pounds dollars	7.50	7.70	7.90	7.40
Man labor [1] hours	1.0	2.5	1.5	1.5
Horse labor do	1.0	3.0	1.5	1.5
Length of time on farm days	135	165	150	165
Initial cost dollars	56.25	69.30	45.03	28.86
Carrying cost:				
Grass	$8.00	$8.00	$8.00	$5.50
Feed	-------	3.50	-------	-------
Man labor	.35	.88	.53	.53
Horse labor	.10	.30	.15	.15
Interest at 8 per cent	1.69	2.54	1.50	1.06
Death loss	.24	.25	.25	.31
Other costs	.50	1.00	.70	.50
Total carrying cost	10.88	16.47	11.13	8.05
Total cost delivered at local shipping point	67.13	85.77	56.16	36.91
Market costs [2]	3.50	4.50	2.90	-------
Total cost at terminal market	70.63	90.27	59.06	36.91
Price per 100 pounds necessary to break even at terminal market	6.75	7.85	7.30	5.95
Necessary margin	−.75	.15	−.60	−1.45

[1] Man labor charged at 35 cents per hour and horse labor at 10 cents.
[2] Freight, commission, yardage, traveling expenses, etc.

It should be borne in mind that the data in Table 8 are intended only as illustrations of how the figures on costs in this bulletin can be used. Anyone wishing to make similar computations must determine the probable costs of the various items included in the carrying charges and the cost of the cattle when going on grass. The first example in Table 8 shows the application of these data to a herd of thin, aged steers which it is assumed weigh 750 pounds apiece and can be purchased at $7.50 per hundredweight or a total cost of $56.25 per head.

It is assumed that these steers will gain 300 pounds and be on grass four and one-half months. The steers will weigh 1,050 pounds when they go to market. The carrying costs are estimated as follows: Grass, $8; man labor, $0.35; horse work, $0.10; interest, $1.69; death loss, $0.24; other costs, $0.50, making a total carrying cost of $10.88. This carrying cost of $10.88 added to the initial cost of $56.25, makes the steer cost $67.13 at the local shipping point. To break even, the steer must sell for $6.40 per hundred or $67.20 a head. The initial cost per 100 pounds was $7.50. By selling at $6.40 per hundredweight at the local shipping point it is possible to break even. This gives a minus margin of $1.10, or the steer can be sold without loss for $1.10 less per hundredweight than it cost.

It is estimated that it will cost $3.50 to ship the steer to the terminal market. This added to the cost of $67.13 gives a total cost at the terminal market of $70.63. The steer therefore would have to sell for $6.75 a hundred to approximately break even at the terminal market.

A reduction of $1 in the cost of the grass would reduce the carrying charge to $9.87, with a total cost of the steer delivered at the terminal market of $69.63. This will make it possible for the steer to sell for $6.60 to $6.65 and break even. In other words, a reduction of $1 in the cost of the grass is equivalent to a difference in the purchase or sale price of about 10 cents per 100 pounds on steers of this weight. This shows the importance of buying and selling at the best advantage to insure the profitable handling of the steers. Reducing the purchase price to $7.40 a hundredweight with all other figures remaining the same would make it possible to sell these steers at $6.65 a hundred or 5 cents per hundred pounds less than with a purchase price of $7.50 per 100 pounds. A reduction of 10 cents in the purchase price is as important in its effect on profits as a reduction of $1 in the cost of the grass for heavy cattle.

The second example in Table 8 is of aged steers fed on grass.

It is assumed that these aged steers fed on grass weigh 900 pounds and cost $7.70 a hundred pounds. With the cost as given above, and assuming a gain of 250 pounds, it is necessary to sell these steers at $7.85 or 15 cents a hundred more than was paid for them. This illustrates the important fact that the higher the carrying costs, the more essential it is to have a plus margin or a very small minus margin.

The other examples in Table 8 are for thin 2-year-old steers and for thin yearling steers on grass only.

In the case of the thin yearlings the necessary margin at the local shipping point is −$1.45. This is a greater minus margin than for any of the other classes, and is due to the fact that the gain put on by the cattle more nearly equals the initial weight. The gain on these yearling steers was approximately 60 per cent of their initial weight. The gain on the older steers was a much smaller proportion of their initial weight, being 40 per cent for the thin aged steers. The younger cattle, with their lighter weight, make it possible to operate on a wider minus margin. It should be kept in mind that this margin for the thin yearling steers is computed at the local shipping point and not at the terminal market as for the other steers. The margin would be less if the marketing charge were included for these yearling steers. It is not included because very few yearling steers are moved from Chase County.

In considering these illustrations it should be kept in mind that they are to show the methods of using these data and to bring out more forcibly those points which must be considered in estimating the price which can be paid for cattle that are to be grazed in the Flint Hills section. To apply this information, the reader should take the basic figures from the tables previously given and apply to these figures the prices which exist at that particular time. For example, thin aged steers can be expected to gain about 300 pounds during the season. (Table 2.) If handled in fairly large herds, they will require about one hour of man labor and one hour of horse work for the season. Grass charges will be based on current prices. Interest will be determined by the purchase price of the cattle and the rate that must be paid on the money for the time it is used. Death loss will amount to about one steer out of every 150 to 250 head. Other costs are small and must be estimated. With these facts it is possible to apply current prices and obtain results which are useful in deciding whether or not to purchase cattle at a given figure.

WINTERING STEERS IN CHASE COUNTY

The number of steers wintered in the Flint Hills will be determined, in part, by the quantity of roughage available in that section and in part, by conditions on the ranges from which these cattle are obtained. If the southwestern ranges have plenty of feed and water, the tendency is to winter the cattle there rather than to bring them to the Flint Hills.

In wintering aged steers in the Flint Hills section little attempt is made to procure large gains. The steers are kept in thrifty condition and put on slight gains. In years when plenty of feed is available, the cattle may be fed more heavily and go on grass as half-fat or fat steers. Younger cattle are wintered less frequently than aged steers. Many of the younger cattle wintered within the county are native to the section. Records were obtained on yearlings and 2-year-old steers only in 1921–22. Records were obtained on aged steers and calves for the seasons 1921–22 and 1922–23. All of the 2-year-old and aged steers included in the records were of range breeding. The gains, daily feed costs, and labor requirements for the steers on which records were obtained are given in Table 9. The 2-year-old steers, full fed after grazing in 1921–22, which are given in this table, are not fully comparable with the other classes of cattle. These 2-year-old steers went to market as fat cattle at the end of the feeding period. All the other steers were roughed through the winter in good condition and turned on grass in the following spring. (Table 9.)

TABLE 9.—*Gains, daily feed costs, and labor requirements per head of steers wintered in Chase County, Kans., in 1921–22 and 1922–23*

Item	Classes of steers by years						
	Aged steers well roughed		Two-year-old steers well roughed[1]	Two-year-old steers full fed after grazing[1]	Yearling steers well roughed[1]	Calves well roughed	
	1921–22	1922–23	1921–22	1921–22	1921–22	1921–22	1922–23
Number of head	253	672	794	399	1,792	316	535
Number of herds	3	5	5	4	11	2	4
Average number per herd	84	134	159	100	163	158	134
Feed lot record:							
Months wintered	3⅙	5½	5⅓	3	5⅔	4.9	5⅖
Out weight ... pounds	1,026	996	768	1,043	--------	--------	--------
Initial weight ... do	929	915	706	927	--------	--------	--------
Gain per head ... do	97	81	62	116	--------	--------	--------
Gain per day ... do	1.02	0.49	0.39	1.29	--------	--------	--------
Feed cost per day ... cents	8.3	11.3	7.7	18.0	3.5	3.0	4.7
Carrying costs per day ... do	13.9	14.8	10.0	22.4	5.7	5.3	6.7
Hours per month on 100 head:							
Man labor ... hours	194	100	99	160	84	83	71
Horse work ... do	394	183	168	254	151	154	113
Total carrying costs	$13.20	$24.42	$16.00	$20.16	$9.69	$7.79	$10.85
Initial cost per head	59.39	63.79	50.41	68.00	37.92	28.43	33.83
Total cost at end of winter period	72.59	88.21	66.41	88.16	47.61	36.22	44.68
Credits (manure and pork)	.81	.67	.28	.91	--------	--------	--------
Net cost at end of winter period	71.95	87.71	66.33	86.89	47.70	36.52	44.79

[1] Records were not obtained on any 2-year-old steers or yearling steers for the winter of 1922–23.

TABLE 10.—*Feed requirements per head for different classes of steers wintered in Chase County, Kans., in 1921–22 and 1922–23*

Item	Class of steers by years						
	Aged steers well roughed		Two-year-old steers		Yearling steers well roughed[1]	Calves well roughed	
			Well roughed[1]	Full fed after grazing[1]			
	1921–22	1922–23	1921–22	1921–22	1921–22	1921–22	1922–23
Number of head	253	672	794	399	1,792	316	535
Number of herds	3	5	5	4	11	2	4
Average number per herd	84	134	159	100	163	158	134
Feeds used:							
Grain[2] ... pounds	--------	433	144	1,000	16	4.6	69
Roughage—							
Alfalfa ... do	734	1,072	985	447	721	642	932
Cane hay ... do	29	105	23	53	324	403	159
Other hay ... do	140	677	31	--------	172	364	--------
Corn fodder ... do	643	214	207	--------	83	17	4
Kafir fodder ... do	156	222	306	--------	364	15	204
Silage ... do	2,491	1,609	2,370	--------	1,008	869	804
Miscellaneous ... do	332	--------	19	--------	49	--------	--------
Pasture (wheat, corn stalk, native) ... days	--------	4.5	17	--------	9	--------	6
Feed per day:							
Grain ... pounds	--------	2.6	0.9	11.3	0.1	--------	0.4
Dry roughage ... do	21.5	13.9	9.8	5.6	10.0	10.1	13.0
Silage ... do	26.4	9.6	14.8	--------	5.9	5.8	5.0

[1] Records were not obtained on any 2-year-old steers or yearling steers for the winter of 1922–23.
[2] Includes a very small quantity of cottonseed cake.

COW HERDS IN CHASE COUNTY

It would be to the advantage of the Chase County farmer who owns or controls about the average acreage of crop land near his pastures, if he could follow some sure system of utilizing his feed and pasture. Risk attends the summer grazing of steers and there is always the chance, each year, that he may not lease his grass advantageously to outside men. With the pasture and feed that is available here, it is possible to reduce speculation in the cattle business by using part of the pasture and feeding the surplus hay, together with the small balances of grain, to cow herds and their calves. The limiting factor undoubtedly will be a stable supply of winter feed.

TABLE 11.—*Distribution of items which enter into the gross cost of producing calves on a few farms in Chase County, Kans., in 1922 and 1923*

Year and ranch No.	Cattle studied		Distribution of annual carrying costs per cow												Percentage calf crop	Gross cost per weaned calf[1]
	Cows	Bulls	Grass	Winter feed	Salt	Man labor	Horse labor	Fences	Buildings and equipment	Taxes	Death loss	Miscellaneous	Interest on cattle	Total		
1922:[2]	*No.*	*No.*													*Pct.*	
46	201	7	$7.18	$10.46	$0.03	$2.35	$0.88	$0.19	$0.48	$0.58	$0.73	$0.26	$5.20	$28.34	80.0	$35.42
47	36	2	6.72	7.57	.02	3.96	1.30	.37	.16	.45	------	1.00	6.25	27.80	80.5	34.53
48	157	11	7.57	8.24	.04	2.50	1.43	.26	.08	.40	.66	.24	4.84	26.26	84.0	31.26
49	119	3	9.08	6.11	.09	2.69	1.06	.36	.04	.39	1.51	.25	4.88	26.46	91.6	28.89
1923:[3]																
46	171	9	8.68	11.54	.07	2.41	1.00	.18	.32	.42	.88	.56	5.90	31.96	83.0	38.51
47	36	2	8.26	13.39	.06	2.65	.87	.72	------	.39	------	.33	6.46	33.13	86.1	38.48
48	169	7	7.80	8.43	.07	2.09	.92	.47	.05	.44	.70	.43	4.81	26.21	83.4	31.43
49	114	4	8.03	13.58	.07	2.97	1.02	.30	.03	.37	.66	.14	5.72	32.89	94.7	34.73
50	118	4	4.46	8.44	.12	1.87	.77	.16	.05	.32	1.10	------	3.76	21.05	64.4	32.69
51	133	3	8.73	10.48	.06	1.16	.37	.17	------	.25	------	.20	3.68	25.10	87.9	28.56

[1] Including 6 per cent interest upon capital invested in the breeding herd and in the equipment and buildings.

[2] The winter of 1921–22 and the summer of 1922.

[3] The winter of 1922–23 and the summer of 1923.

TABLE 12.—*The cost of maintaining breeding cows and of producing calves in specified areas of Colorado and Texas in 1922 and 1923*

State and year	Gross annual carrying cost per cow	Percentage calf crop	Gross cost per weaned calf
Colorado:			
Prairie ranches—		*Per cent*	
1922	$20.51	56.0	$36.62
1923	18.93	59.0	32.08
Mountain ranches—			
1922	24.09	56.7	42.49
1923	23.93	60.0	39.88
Texas:			
North central area—			
1922	27.22	66.9	40.69
1923	29.46	65.0	45.32

The cost of producing calves was obtained on four farms in Chase County, Kans., in 1922 and six farms in 1923. (Table 11.) Only one farm averaged less than an 80 per cent calf crop. No other factor influences the cost of producing calves as much as the size of the calf crop. In this respect the Chase County farmer is at a decided advantage over the western range man. (Table 12.) With farm-grown winter feed close at hand it should be possible for him to have his breeding herd in good shape when it comes out of the winter. By careful handling under the small-fenced-pasture conditions that exist here the calf crop should be kept well above 80 per cent.

TABLE 13.—*Kind and average quantity of winter feeds consumed and acres of pasture grazed annually per head by cows on a few farms in Chase County, Kans., in 1922 and 1923*

Year and ranch No.	Calf crop	Cost of winter feed	Kinds and quantities of winter feed								Pasture per cow
			Grain	Alfalfa	Cane hay	Other hay	Straw	Corn fodder	Kafir fodder	Sorghum and kafir silage	
1922: [1]	*Per cent*	*Dollars*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Acres*
46	80.0	10.46	72	468	--------	--------	--------	710	250	3,175	6.4
47	80.5	7.57	--------	501	876	--------	--------	--------	1,500	1,467	4.8
48	84.0	8.24	32	776	703	100	--------	414	140	2,267	5.0
49	91.6	6.11	--------	818	721	--------	849	720	149	--------	7.3
1923: [2]											
46	83.0	11.54	141	731	--------	--------	--------	1,777	--------	2,368	7.1
47	86.1	13.39	43	971	177	138	--------	--------	--------	1,447	4.2
48	83.4	8.43	5	822	655	108	568	626	382	695	5.8
49	94.7	13.58	173	1,378	245	65	--------	139	1,154	--------	5.5
50	64.4	8.44	143	802	171	187	1,017	1,665	51	--------	5.5
51	87.9	10.48	50	1,292	--------	--------	300	--------	14	1,768	8.3

[1] The winter of 1921–22 and the summer of 1922. [2] The winter of 1922–23 and the summer of 1923.

A surplus of roughage suitable for winter feed will exist in Chase County under a grazing system which uses the pastures entirely for carrying steers. It would seem, with the supply of feeding stuffs here and in the face of gradually increasing costs attached to the range production of cattle farther west, that a portion of the pastures of the Flint Hills section might well carry enough breeding cows to use up the roughage produced on the tillable land. (Table 13.) For the major portion of the pasture in this section, however. steers will continue to be used as the means of marketing grass.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

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